Overview of NOAA/NWS Collaborative Science Technology and Applied Research (CSTAR) Program

Presentation to
1st NOAA Testbed USWRP Workshop

Sam Contorno,
NWS/Office of Science and Technology
CSTAR Program Manager
Apr. 28, 2009

NWS CSTAR Program

Overview

- ✓ Fully competitive, in-house grants program started in 2000.
- ✓ One- to three-year projects--maximum funding level $125K/yr.
- ✓ Objective: To improve local forecast and warning services by exploiting S&T advances.
- ✓ How: Applied research and education projects involving collaboration between operational forecasters and university scientists.
- ✓ Proposals must address national, regional or NCEP-related science needs/priorities.
- ✓ Program works hand-in-hand with NWS-funded COMET Outreach Program

CSTAR

Current Program

Two CSTAR projects complementary to HMT efforts were provided USWRP funding support beginning in 2007.

- *UA-SUNY*
- *University of Utah*

UA-SUNY

Cooperative Research with the NWS on Cool- and Warm-Season Precipitation Forecasting over the Northeastern U.S.

- ✓ Principal Investigators: Lance Bosart, Dan Keyser
- ✓ Duration: 1 May 2007 - 30 April 2010
- ✓ Project research addresses the following challenging northeastern U.S. forecast problems:
  - *Stratiform-dominated cool-season precipitation systems.*
  - *Convection-dominated warm-season precipitation systems.*
  - *Stratiform dominated cool-season precipitation systems with embedded low-topped severe convection.*

Univ. Utah

Improved Monitoring, Analysis, and Prediction of High Impact Weather

- ✓ Principal Investigators: John Horel, Jim Steenburgh, and C. David Whiteman
- ✓ Duration: 1 May 2007 - 30 April 2010
- ✓ Core objective:
  - *Improve the capabilities of operational forecasters to understand, analyze, and forecast high impact weather events that are strongly modulated by the characteristics of the underlying surface*
- ✓ Specific goals:
  - *Utilize effectively mesonet observations for a variety of applications.*
  - *Contribute to improvements in the Real Time Mesoscale Analysis and future Analysis of Record surface analyses.*
  - *Enhance understanding, analysis, and prediction of high impact weather influenced by the underlying terrain through data analysis, real-data model simulations, improved conceptual models and training materials.*

Why CSTAR?

- ✓ Resources unavailable for HMT effort to support extramural projects.
- ✓ Concept of leveraging active FY07 CSTAR RFP for this purpose discussed by NUEC.
- ✓ Decision made to provide USWRP support to two QPF-related CSTAR projects.
  - *Tim Schneider served on review panel.*
  - *NUEC/M. Ralph apprised of selections/process.*
- ✓ NWS and USWRP working to "tighten" this relationship in advance of upcoming RFP in case support continues for another cycle.

Other Current CSTAR Awards

QPF

NC State (05/01/07 – 04/30/10): Improving Understanding and Prediction of Warm Season Precipitation Systems in the Southeastern and Mid-Atlantic Regions (Lackmann, Parker, Xie)

Modeling and Analysis

Oklahoma (05/01/07 – 04/30/10): A partnership to develop, conduct, and evaluate realtime high-resolution ensemble and deterministic forecasts for convective-scale hazardous weather (Droegemeier, Xue, Kong, Coniglio)

Washington (05/01/07 – 04/30/10): Improvement of Mesoscale Analysis and Prediction (Mass and Hakim)

Hydrology

Hawaii (08/01/08 - 07/31/11): Evaluation of Flash Flood Prediction Models for Small Watersheds in Tropical Islands (Fares, Chu, Michaud)

Current CSTAR Awards (con't)

Tropical/Marine

Florida Institute of Technology (05/01/07 - 04/30/10): A Real-Time Coupled Wave/Atmospheric Regional Forecast and Analysis System: CWARFS (Lazarus, Zarillo, Chiao)

Washington (08/01/08 - 07/31/11): Improving Marine Weather Prediction with Satellite-Derived Products (Patoux, Brown)

Forecast/Warning Processes

Texas A&M (08/01/08 - 07/31/11): Lightning in the Nowcasting and Warning Process: Cooperative Research Applied to NWS Needs and Priorities (Orville, Schumacher)

Expired CSTAR Awards

QPF

Albany/SUNY (04/01/04 – 03/31/08): Continuing Studies of Cool and Warm Season Precipitation Events over the Northeastern United States

NC State (06/01/03 – 05/31/07): Improving Cold Season QPF in the SE US

Albany/SUNY (01/01/01 – 12/31/03): Improving prediction of cool- and warm-season heavy precipitation events over NE US

Florida State (05/01/01 – 04/30/04): Operational system for probabilistic QPF

Saint Louis (5/1/00-4/30/03): Improved QPF in the Central Region

Expired CSTAR Awards

Modeling and Analysis

Utah (07/01/04 – 06/30/08): NWP, Local Weather, Mesoscale Observations in Intermountain West

Washington (10/01/03 – 9/30/07): High-res NWP, grid post-processing, ensemble methodologies

Florida State (10/01/03 – 09/30/07): Ensemble precip forecasts, CG lightning climo, hydrological modeling for flash flood events

Utah (07/01/01 – 06/30/04): NWP and local weather prediction in Intermountain West

Radar

Oklahoma (04/01/04 – 03/31/07): Improving Tornado Detection with WSR-88D Using Spectral Analysis

Desert Research Institute (1/1/00-12/31/02): Improving WSR-88D QPEs in the Inter-mountain West

Expired CSTAR Awards (con't)

Forecast/Warning Processes

Saint Louis (10/01/03 – 09/30/07): Improving Prediction of Significant Weather Events in CR

Texas A&M (04/01/01 – 03/31/04): Lightning climatologies/QPF in Southern Region

NC State (5/1/00-4/30/03): Topographically-forced weather systems in Carolinas and Virginia

Tropical/Marine

Rhode Island (5/1/00-4/30/03): Transitioning coupled hurricane-ocean model to operations

CSTAR Benefits

- ✓ Forecast and Warning Improvement
  - Quantitative comparisons demonstrate offices participating in collaborative research projects outperform those that do not. (Waldstreicher, 2005)
  - Accelerated transition of research to operations.
  - Contributions cover four NOAA Mission Goals (Clim, W&W, C&T, Eco) and several cross-cutting priorities.

- ✓ Leveraging Resources
  - Value of engaging world-class researchers, staffs, students at academic institutions far exceeds cost.
  - Excellent student recruiting tool for university recipients.

CSTAR Benefits

✓ Human Resources

- As of Fall 2008, 48 CSTAR "alumni" have been subsequently employed by NOAA.
  - *2 former PIs (Steve Koch and Dave Kingsmill).*
  - *Of the 46 students, 38 are currently full time NOAA employees, 2 are contractors, and 2 have left NOAA to return to school for advanced degrees.*
  - *4 SOOs.*
  - *Produced by 24 projects (including 9 still in progress).*

- <u>Breakdown by Institution</u>
  - *NC State - 15 (14 students and 1 PI)*
  - *Florida State – 9*
  - *St. Louis – 8*
  - *Utah – 7*
  - *SUNY-Albany – 5*
  - *DRI - 1 (PI)*
  - *Oklahoma – 1*
  - *Washington – 2*

- <u>Breakdown by FMC/LO</u>
  - *ER - 10*
  - *WR - 10*
  - *CR - 7*
  - *SR - 7*
  - *NCEP - 7 (2 HPC, 2 TPC, 1 each OPC, AWC, NCO)*
  - *AR - 2*
  - *OST - 2 (MDL)*
  - *OAR - 3 (ESRL)*

CSTAR Benefits

Specific Example: NWS WFOs

February 2006 East Coast Blizzard

- ✓ Eastern U.S. WFOs have studied precipitation forecast challenges with recipients UA-SUNY and NC State since CSTAR inception.
  - *Role of snow microphysics in determining snowfall ratios.*
  - *Physical processes responsible for mesoscale snow banding.*

- ✓ Results concerning mesoscale banding were incorporated into step-by-step forecast strategy.
  - *Training on this strategy has been provided to forecasters via teletraining, WES simulations, professional presentations, and office seminars over the past 3 years.*
  - *Paper on topic published in the February 2006 WAF.*

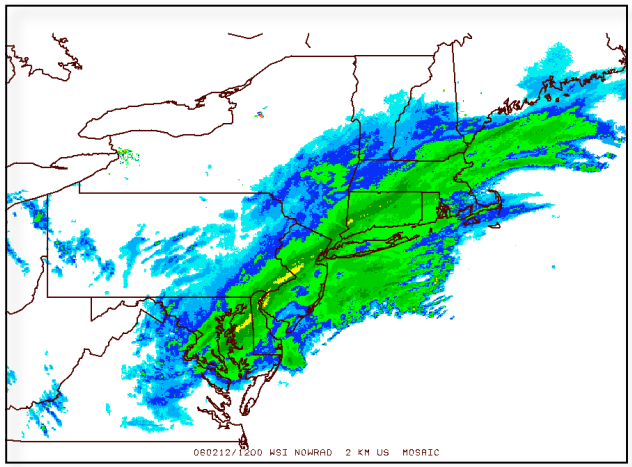
CSTAR Benefits

Specific Example: NWS WFOs

February 2006 East Coast Blizzard (con't)

- ✓ Forecast strategy was used during the Feb '06 Blizzard to recognize potential for banding up to 60 hours in advance of event.
  - *All 9 ER WFOs affected by intense snowband aligned along I-95 corridor explicitly mentioned potential in products at least 24 hrs in advance.*
- ✓ Strategy provided confidence to issue blizzard warnings with 24 hr lead time, and pinpoint band location/intensity, including possibility of lightning, 6 hrs in advance

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE UPTON NY
138 AM EST SUN FEB 12 2006
...EXPLOSIVE SNOW DEVELOPMENT EXPECTED TO CONTINUE OCCURRING FOR THE REST OF THE OVERNIGHT HOURS INTO SUNDAY MORNING WITH SNOWFALL RATES APPROACHING 3"/HR IN SPOTS. ISOLATED THUNDER WILL LIKELY BE OBSERVED TOWARD DAYBREAK IN A FEW BANDS...



CSTAR
Upcoming Milestones

- ✓ Six projects expire in the Spring 2010 timeframe
  - *Utah, UA-SUNY, FIT, NC State, Washington (Mass), and Oklahoma*

- ✓ NWS will issue next RFP as part of NOAA Omnibus announcement to be release in June/July

  - *Expectation will be to fund 4-6 new project starting Spring 2010*
  - *Science needs/priorities will be updated*
  - *OST exploring options to increase flexibility in awards to allow for some growth over the course of the project period*

Questions?

Sam Contorno

samuel.contorno@noaa.gov

301-713-3557x150